

INTERNAL CUTTER

Instruction Manual 5600



Internal Cutter

One Company Unlimited Solutions

NOV NATIONAL OILWELL VARCO

Internal Cutter

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The designs and specifications for the tools described in this instruction manual were in effect at the time this manual was approved for printing. National Oilwell Varco, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change designs and specifications without notice or without incurring obligation.

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General Description

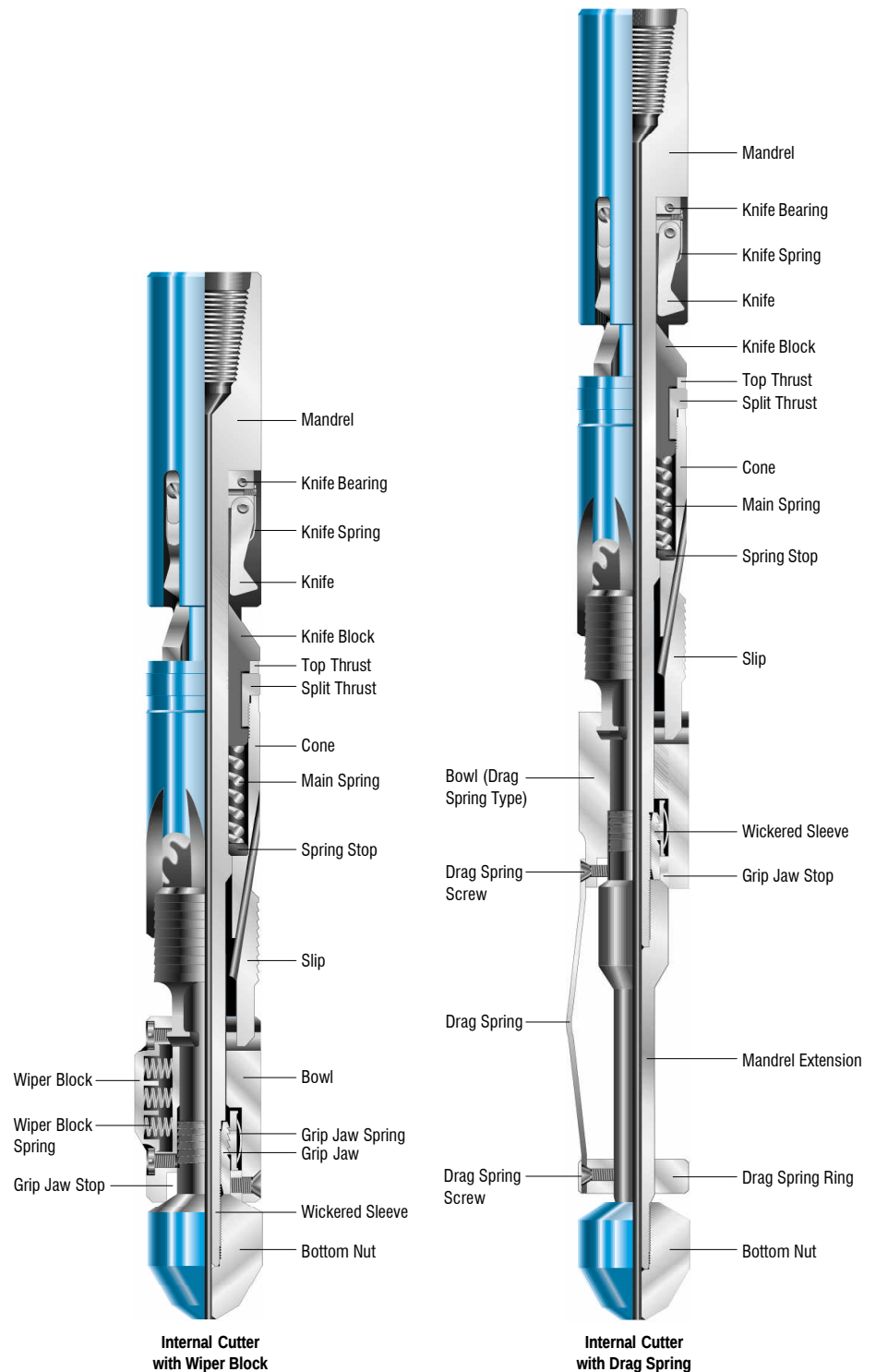
Bowen Internal Cutters are ruggedly built, efficient tools for cutting tubing, casing or drill pipe. Sizes ranging from 1.900" tubing up to 20-3/4" casing are available. Bowen Internal Cutters are manufactured to exacting standards of interchangeability, permitting relative ease of maintenance after use and the redressing of a basic assembly to cut alternate sizes of pipe. (See Specification table for sizes, part numbers and "can be dressed to cut" sizes.)

Use

The Bowen Internal Cutter is used to cut tubing, casing or drill pipe. It may be run on "macaroni" tubing, tubing or drill pipe, depending upon the diameter of the pipe to be cut.

Construction

The Bowen Internal Cutter consists essentially of a Wiper Block (or a Drag Spring Assembly) to accomplish setting in the pipe, Slips and Cone Assembly to anchor the tool, a Main Spring to assist in maintaining uniform feed to the Knives, wedge-like Knife Blocks to drive the Knives upward and outward to engage the pipe, and especially hardened and ground Knives for easy, efficient pipe cutting. A feature of the Bowen Internal Cutter is the "Automatic Bottom" which permits the operator to set the cutter easily at any desired depth, to release the tool by simply pulling upward, and to reset at another depth - all without coming out of the hole.



Operation

The Bowen Internal Cutter should be thoroughly examined to assure that it is properly assembled, all threaded connections made up tightly and that it is properly dressed for the size pipe to be cut. Refer to the Reassembly Procedure and the Specification Chart on the following pages for the correct assembly, part numbers and dimensions.

The Bowen Internal Cutter is made up on the bottom of the cutting string. The cutting string may be "macaroni" tubing or drill pipe, as the diameter of the pipe to be cut and the circumstances dictate.

Running In

Before lowering in the well, check the Bowen Internal Cutter to be sure that the Automatic Bottom is fully engaged. This engagement holds the cutter in a released position with the Slips and Knives retracted while running into or out of the well.

CAUTION: Avoid right-hand rotation as the Bowen Internal Cutter is lowered into the well because right-hand rotation will release the Automatic Bottom and set the cutter in operating position. If this should occur, slowly raise the cutting string and the Wickered Sleeve will be reengaged by the Grip Jaws to reset the cutter in running position.

Conventional Cutting Procedure

Upon reaching the desired cutting depth, the Bowen Internal Cutter is anchored by slowly rotating to the right while slowly lowering the run-in string. The Wiper Blocks (or Drag Springs) resist rotation and lowering by maintaining friction on the pipe. This disengages the Automatic Bottom from the Grip Jaws. Continued lowering or "creeping" of the run-in string causes the Cone to move the Slips upward and outward to anchor the cutter

in the pipe. The Mandrel is free to travel downward under the Knife Blocks forcing the Knives upward and outward to start the cut. Slight additional weight is applied while slowly rotating to the right. The Main Spring in the upper part of the cutter is partially compressed by the applied weight and assists in maintaining a uniform feed to the Knives.

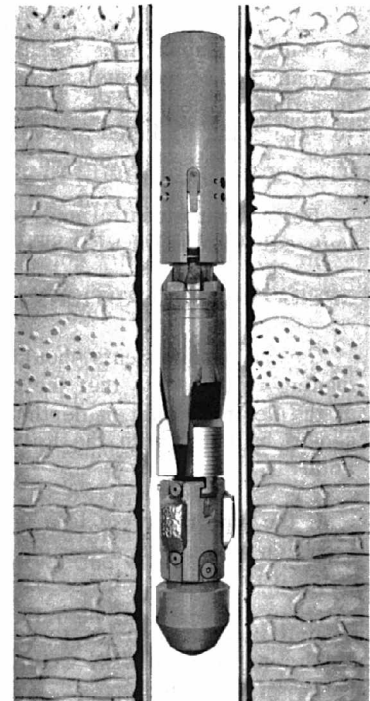
Cutting is accomplished by slow rotation to the right (10 to 18 rpm) with just enough weight being applied gradually to feed the Knives into the metal. Care should be exercised not to try to hurry the cutting operation as excess weight will cause the Knives to dig into the pipe burning the Knife points.

For best operation, the run-in string is lowered in 1/16" intervals — never more than 1/8" — a total lowering of 1-1/4" will complete the cut.

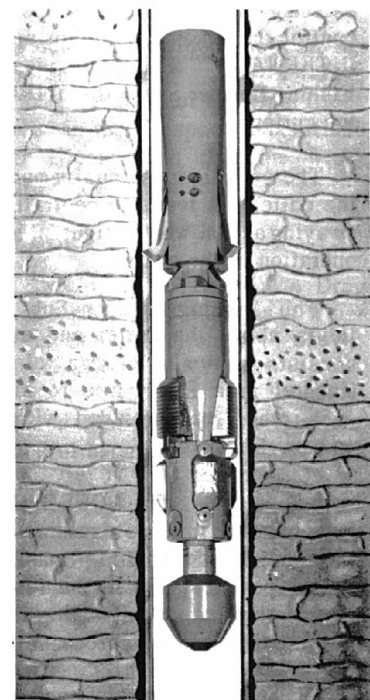
Free rotation, with little or no reverse torque, indicates that the cut is completed. To prove the cut, increase the rotating speed; and if no increase in torque is noted, it will indicate that the cut has been successfully completed.

The Bowen Internal Cutter may now be released for removal from the hole, or reset to make as many additional cuts as desired. Raise the run-in string one foot. This will cause the Grip Jaws to engage the Wickered Sleeve, and now the tool is ready to be raised or lowered, as desired.

For maximum control and efficiency in making cuts, a Bowen Power Swivel is recommended.



Running In



Cutting

Operating Precautions

Careful measurements should be maintained while running in to assure that the cut or cuts are made at the desired depth or depths. All measurements should be taken with the Knives as the reference point.

If the pipe to be cut is a full string, see Nomograph on page 8 to determine the lowest point at which it is loose.

If it is desired to locate a collar at the cutting depth, install a Bowen Collar Finder on the bottom of the cutter.

At great depths, in crooked holes and where existing rig equipment makes it very difficult to control the amount of weight applied to the Bowen Internal Cutter, it is recommended that a Fishing Bumper Sub and stabilizer be made up above the cutter.

The stabilizer is usually made up one joint above the cutter. It tends to centralize and minimize any swaying action which might interfere with the smooth operation of the cutter.

The Fishing Bumper Sub is run a number of joints above the cutter and stabilizer. This tool consists basically of two telescoping members, a Mandrel in a Body, free to slide with relation to each other, but provided with mating splines for transmitting torque.

In operation, the Bowen Internal Cutter is set in the pipe as explained in "Operation". In this position the Fishing Bumper Sub is in the fully closed position. Since the tool is provided with a 20" stroke, the cutting string is then picked up 10" so that the only weight on the cutter is the predetermined weight of the pipe between the cutter and the Bumper Sub. In this manner the variables of rig equipment and the inadvertent application of too much weight is eliminated and a smooth cut is made.

We recommend the following tools for this operation:

Bowen Fishing Bumper Sub
Bowen Stabilizer

A complete description of Bowen Fishing Bumper Subs is presented in Instruction Manual 4460, available on request.

Maintenance

For best performance and to prolong the life of Bowen Internal Cutter, it should be thoroughly cleaned, serviced and either lubricated or painted after each use and before storing.

Disassembly

1. Secure the Bowen Internal Cutter in an appropriate vise at the upper end of the Mandrel.
2. Unscrew the Bottom Nut from the Mandrel.
3. Rotate the Wiper Block three full revolutions to the right, then move the Bowl upward against the Slip Cone.
4. Back the Slip Cone off the Split Thrust and remove with Slips and Bowl.
5. Withdraw the Bowl and Slips from the Mandrel.
6. Remove the Wiper Blocks from the Bowl by removing the Wiper Block Screws.
7. Remove the three Grip Jaw Screws at the lower end of the Bowl, then withdraw the Grip Jaw Stop from the lower end of the Bowl.
8. Remove the Grip Jaws and Springs from the inside of the Bowl.
9. Unscrew the Cone from the Split Thrust and remove from the Mandrel.

10. Remove the Split Thrust (two halves) from the Mandrel.
11. Remove the Slotted Main Spring Stop from the Mandrel, then withdraw the Main Spring.
12. Remove Knife Spring Screws and Springs.
13. Remove Knife Pin Screws; then with a pin punch, drive out Knife Pins and withdraw the Knives.
14. Remove Knife Bearing Screws, then withdraw Knife Bearings.
15. Slide the Knife Blocks to the top of the grooves on the Mandrel, then remove the Top Thrust by withdrawing Thrust against lugs on the Mandrel, rotating one sixth turn to allow the Thrust passage over the Mandrel.
16. Withdraw the Knife Blocks.
17. Carefully clean, then inspect all parts for wear and damage. Replace all worn and damaged parts with new parts.

Reassembly

All parts should be thoroughly cleaned, then greased with a good grade of lightweight grease. All parts damaged or worn by previous runs should be replaced.

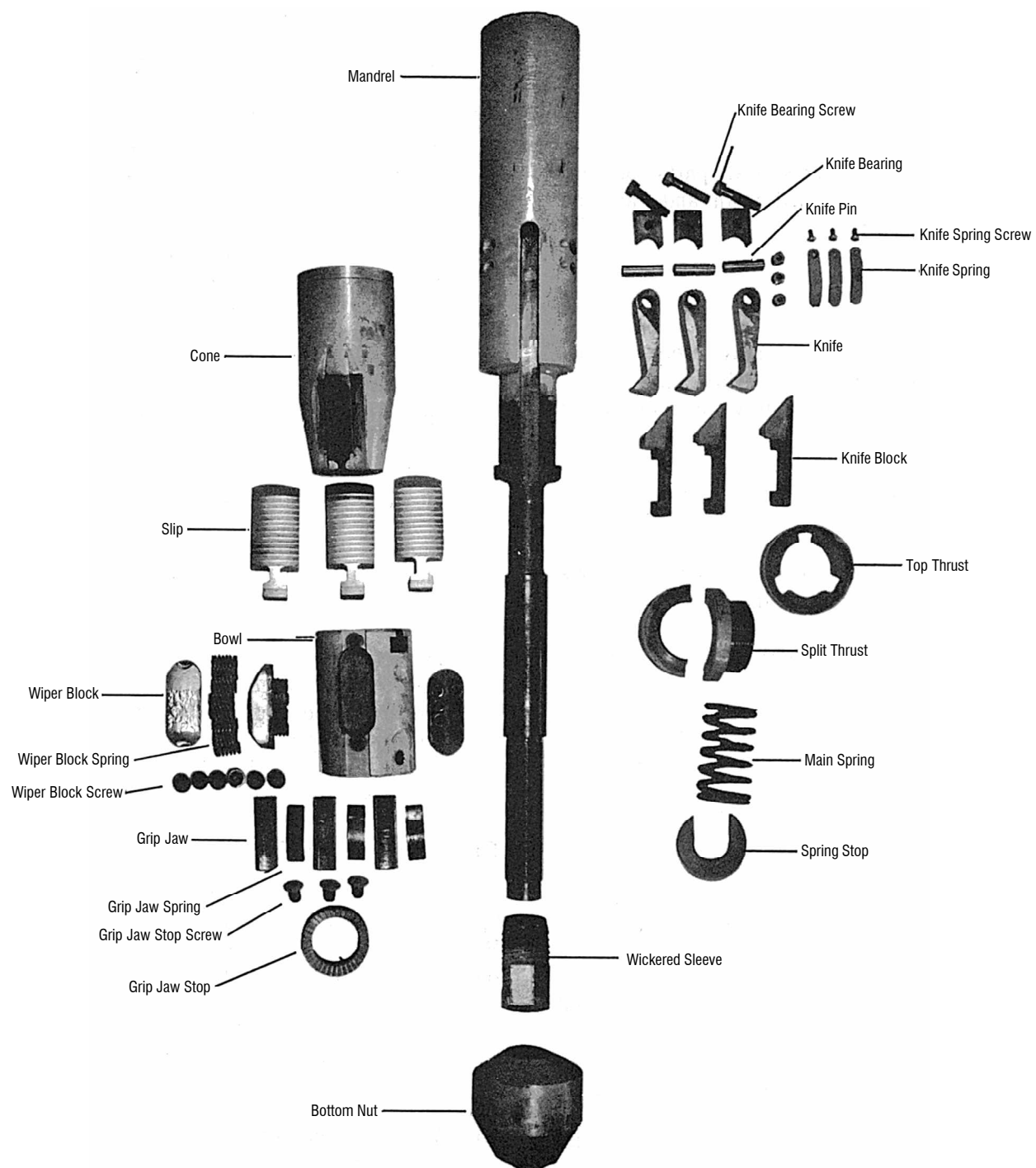
1. Secure the Mandrel in suitable vise, clamping it near the upper end.
2. Insert Knife Bearings in the top of the groove in the Mandrel and install the Bearing Screws.
3. Insert Knives in the Mandrel grooves, then install Knife Pins and Screws.
4. Insert Knife Blocks, sliding them upward to the extreme top position under the Knives.

5. Install the Top Thrust on the Mandrel with the hardened and ground surface facing the bottom of the Mandrel. With the Top Thrust positioned and passed over the Mandrel lugs, rotate one sixth turn to permit the Top Thrust to pass over the Knife Blocks.
6. Slide Knife Blocks to position at the lower end of the Mandrel grooves.
7. Install the Knife Springs on the Knife Blocks.
8. Install Main Spring on Mandrel, resting on the Mandrel lugs.
9. Compress the Main Sprig, then install the Spring Stop.
10. Install the Split Thrust (two halves) between face of the Top Thrust and the lugs of the Mandrel.
11. Install Cone on the Mandrel, threading it up tightly onto the Top Thrust.
12. Install Grip Jaws with a Grip Jaw Spring positioned behind each into the grooves at the lower end of the Bowl. (GRIP JAWS ARE INSTALLED CLOCKWISE IN NUMERICAL ORDER WITH THE NUMBER FACING OUT.)
13. Install Grip Jaw Stop with the bevel toward the bottom of the Bowl, securing in position with the three Grip Jaw Stop Screws.
14. Place the Slips in the slots of the Bowl and position on Slip Cone, aligning the Slips into the dovetail grooves of the Cone. Slide Assembly upward on the Mandrel and thread onto the Split Thrust.
15. Screw the Wickered Sleeve onto the Mandrel, making up tightly. Use wrench flats provided.
16. Install Bottom Nut on the Mandrel, making it up securely with a large wrench.
17. Thread Bowl into position on the Wickered Sleeve to its lower position, retracting the Slips.
18. Install Wiper Blocks in provided slots in the Bowl, with the long (60 degree) bevel facing the lower end. Make certain that all Wiper Block Springs are placed in their respective positions under the Wiper Blocks and that the Wiper Block Screws are made up securely.

Drag Spring Assembly

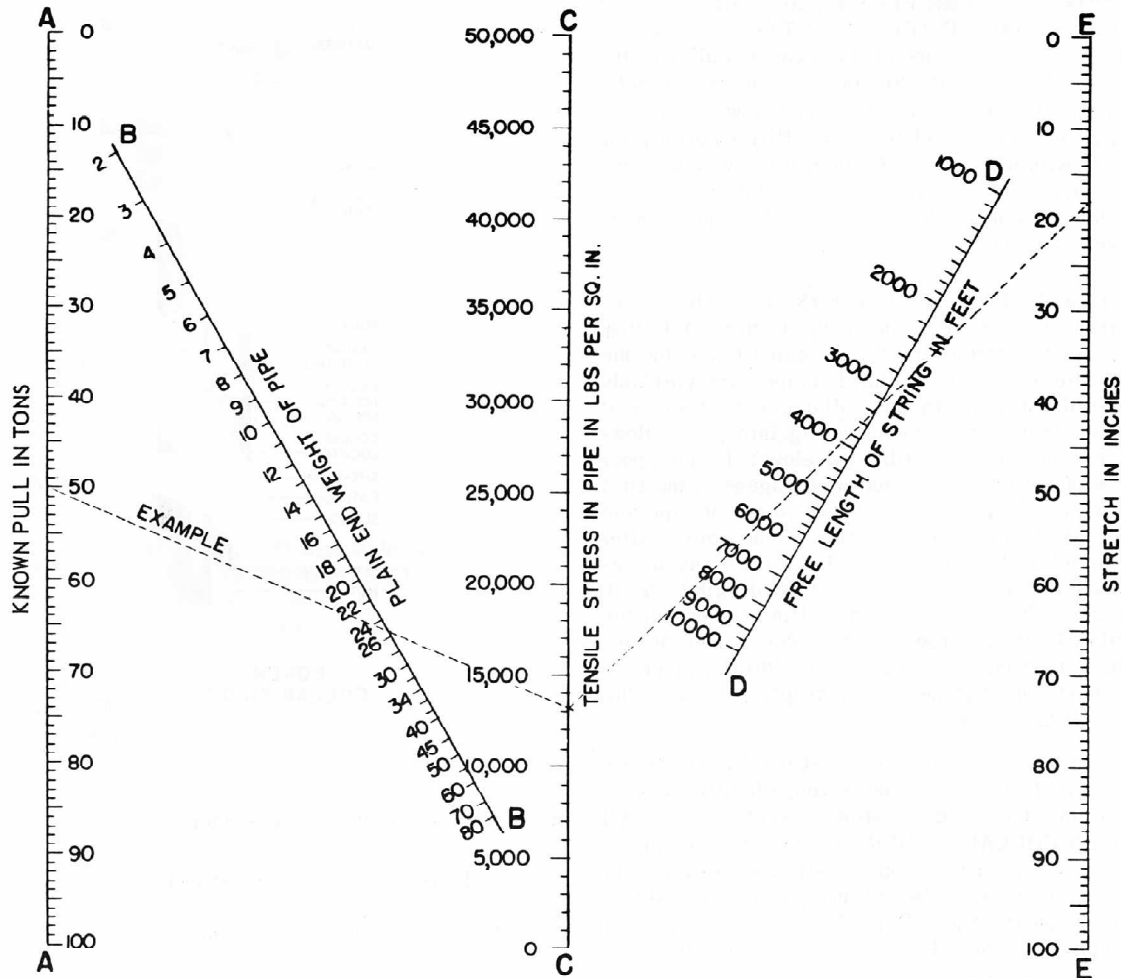
The Bowen Internal Cutter with a Drag Spring Assembly is assembled the same as a Wiper Block Assembly as in Steps 1 through 14 above; thereafter, the assembly differs as follows:

15. Screw the Wickered Sleeve or Mandrel Extension onto the Mandrel securely, using the wrench flats provided.
16. Attach one end of the three Drag Springs to the Bowl with the Drag Spring Screws.
17. Slide the Drag Spring Ring onto the Wickered Sleeve, then attach bottom end of Drag Springs to the Drag Spring Ring with the Drag Spring Screws.
18. Make up Bottom Nut.



Bowen Internal Cutter
Parts Required to Assemble Using Wiper Block Assembly

Nomograph for Determining Free Length of Pipe



Use of Chart

1. Determine plain end weight of pipe.
2. Pick up dead weight of string of pipe.
3. Mark pipe with respect to a stationary object.
4. Take a known pull on pipe.
5. Remark pipe with respect to same stationary object.
6. Measure distance between marks. This gives stretch in inches.
7. Place straight edge on scale "A" thru known pull and on scale "B" thru plain end weight, on scale "C" read stress.
8. Pivot straight edge on scale "C" until it passes thru stretch on scale "E", on scale "D" read free length.

Example

Given 6-5/8 to 26 lbs. casing (plain end wt. 25.65 lbs.) The pipe was picked up to 20 tons to overcome the dead weight and then marked, after which it was picked up to 70 tons and remarked. The distance between the marks was 18", and the known pull was 50 tons (the difference between the two pulls). From the chart this gives a free length of 3,350 feet.

Accessories

Bowen Collar Finder

Bowen Collar Finders are available for all sizes of Bowen Internal Cutters. They enable the operator to locate the nearest collar at the cutting depth. With this information, the operator can then set the Cutter above or below the located collar and thus avoid the possibility of attempting to cut within a collar. Furthermore, by making the cut either immediately above or below the located Collar it is possible to salvage the pipe in more usable lengths.

Bowen Collar Finders assemble in the bottom of the Bottom Nut of the Cutter. A Bottom Nut with a threaded plug is substituted for the standard nut. The Collar Locators are yieldably pressed outwardly by the Collar Locator Springs at angles that permit free lowering into pipe. However, when the assembly is elevated, the upper ends of the Collar Locators will engage in the first encountered space between two joints of pipe and thus locate the exact position of the joint. After the joint is located, the Collar Finder may be released by exerting sufficient upward pull to break the Shear Pin. When the Shear Pin is sheared, the Collar Locators drop into the Sleeve and are retained therein. To prepare the Collar Finder for the next run, it is necessary simply to replace the Shear Pin.

During the running in of the string it is necessary at intervals to elevate the string slightly in order to remove the rig table slips or spider slips. All Bowen Collar Finders are, therefore, equipped with a Spring, and this Spring will absorb over eight inches of elevation before any pressure is exerted directly on the Shear Pin. Thus the possibility of snapping the Shear Pin during the running in of the string is eliminated.

Collar Location

At the cutting depth, elevate the cutting string slowly until a slight but noticeable jarring reaction occurs in the string. Mark the string at this point. The Bowen Collar Finder is now within a located collar. From this point, locate the Knives of the Cutter at the desired point either above or below the located collar.

Bowen Collar Finder Maintenance

To guard against failures and to prolong the life of the tool, the Collar Finder should be thoroughly serviced after each group of runs.

A. To dismantle the Collar Finder:

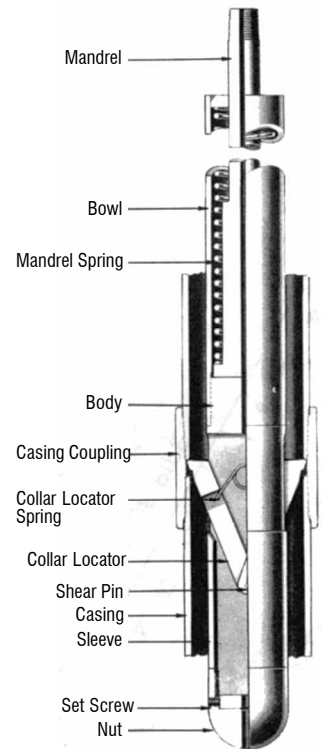
1. Remove the broken Shear Pin.
2. Unscrew the Body from the Bowl.
3. Slide the Mandrel and the Mandrel Spring from the Bowl.

B. Clean and carefully check all parts and replace worn or damaged parts with new ones.

C. Grease all working parts.

D. To reassemble the Collar Finder:

1. Insert the Mandrel Spring and Mandrel in the Bowl.
2. Screw the Body into the Bowl.
3. If a new Collar Locator Spring or Collar Locator is required:
 - a. Insert the end of the Collar Locator Spring from the unnotched side through the small hole in the Collar Locator.
 - b. Bend the end of the Collar Locator Spring into the notch on the side of the Collar Locator.
4. Install new Shear Pin. See page 17.
5. Paint or grease the exterior of the tool to prevent rust between jobs.



Bowen Collar Finder

Bowen Stabilizers

Bowen Stabilizers assemble one single joint above the Bowen Internal Cutter. They are box to pin substitutes consisting of a Body and a set of three Friction Springs which are free to re-rotate. The Friction Springs absorb any swaying motion of the cutting string, centralizing the Cutter, equalizing pressure on the Knives and eliminating any possibility of creeping on the part of the Slips.

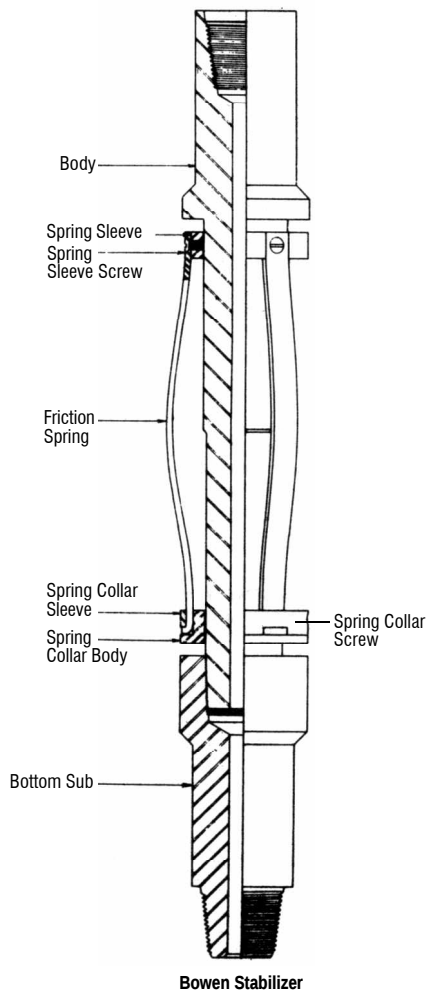
Bowen Stabilizer Maintenance

To guard against failures and to prolong the life of the tool, the Stabilizer should be thoroughly serviced after each group of runs.

A. To dismantle the Stabilizer

1. Unscrew the three Spring Sleeve Screws.
2. Unscrew the three Springs Collar Screws.
3. Slip the Spring Collar Sleeve from the Spring Collar Body and remove the Friction Springs.
4. Unscrew the Bottom Sub from the Body and slip off the Spring Collar Body, Spring Collar Sleeve and Spring Sleeve.

B. Clean and carefully check all parts and replace worn or damaged parts with new ones.



Bowen Internal Cutter - Ico Type

Principal parts of all cutters are shown in the column under an assembly no. and may be adapted to cut all other sizes in its range by substituting the parts shown under a given "can be dressed to cut" table. This includes the "extra" parts.									
Designed To Cut		1.9	2-3/8	2-7/8	2-7/8	3-1/2	4-1/2	4-1/2	5
		Tub.	Tub.	Tub.	Tub.	O.D.	F.H.D.P.	I.F. D.P.	I.U.D.P.
Can Be Dressed To Cut - See Table On Pages 14 And 15			2-7/8		3-1/2	4	4-1/2	4-1/2	
			I.F.D.P.		I.F.	Tub.	F.H.D.P.	Csg.	
			2-7/8		D.P.	4-1/2	4-1/2	4-3/4	
			Tub.			Tub.	Csg.	Csg.	
Minimum O.D.		1-1/2	1-13/16	2-1/4	2-1/4	2-5/8	2-1/2	3-3/8	3-3/8
I.D.		Solid	Solid	Solid	Solid	1/2	Solid	Solid	Solid
Standard Assembly With Drag Spring Or Wiper Block									
		D.S.	D.S.	D.S.	D.S.	W.B.	D.S.	W.B.	D.S.
Complete Assembly	Part No.	25940	2174	8505	9176	8570	9465	8844	9081
	Weight	15	16-1/2	22	28-1/2	39	39	54	71

Replacement Parts

Mandrel	Part No.	25941	2175	8506	9177	8571	9466	8845	9082
	Weight	6	7	10	11	17	15	33	33
Knife Bearing (3 Req'd.)	Part No.	25942	8433	8433	8575	8575	8575	8575	8575
	Weight	1/16	1/16	1/16	1/8	1/8	1/8	1/8	1/8
Knife Spring Screw (3 Req'd.)	Part No.	13834	8181	8181	8181	8181	8181	8181	8181
	Weight	1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Knife Spring (3 Req'd.)	Part No.	25959	8434	8434	8629	8629	8629	8629	8629
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Knife (3 Req'd.)	Part No.	25943	8432	8432	8572	8572	6807	8572	9042
	Weight	1/8	1/8	1/8	1/4	1/4	1/4	1/4	3/4
Knife Bearing Screw (3 Req'd.)	Part No.	23501	8529	8567	9189	8576	8576	8576	8576
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Knife Pin (3 Req'd.)	Part No.	25944	8501	8501	8573	8573	9467	8573	8573
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
Knife Pin Screw (3 Req'd.)	Part No.	12484	8445	8445	8574	8574	8445	8574	8574
	Weight	1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Knife Block (3 Req'd.)	Part No.	25945	8436	8507	8580	8580	6809	8846	8846
	Weight	1/8	1/8	1/8	1/4	1/4	1/4	1/2	1/2
Top Thrust	Part No.	25946	9421	8508	9422	8612	6810	8931	8847
	Weight	1/8	1/4	1/4	3/8	1/2	1/2	3/8	1/2
Split Thrust	Part No.	25947	8438	8509	9179	8582	7496	8848	8848
	Weight	3/8	3/8	1/2	5/8	3/4	1	1-1/4	1-1/4
Cone	Part No.	25948	2177	8510	9180	8583	9468	8849	9083
	Weight	3/4	1-1/4	1-3/4	2-3/4	4	5	6-1/2	6-1/2
Main Spring	Part No.	25949	8440	8440	9191	8584	9469	8850	9084
	Weight	1/8	1/8	1/8	1/8	1/4	1/4	1/4	3/8
Spring Stop	Part No.	25950	8442	8442	9192	8585	8585	8851	8851
	Weight	1/16	1/16	1/16	1/16	1/16	1/16	1/8	1/8
Slip (3 Req'd.)	Part No.	30059	2180	4005	2178	8586	7201	8852	9043
	Weight	1/8	1/8	1/4	1/8	1/2	2 Req'd.	3/4	1
Grip Jaw (Set)	Part No.	25951	8443	8443	8443	8588	8588	8588	—
	Weight	1/8	1/8	1/8	1/8	1/8	1/8	1/8	—
Grip Jaw Spring (3 Req'd.)	Part No.	8444	8444	8444	8444	8589	8589	8589	—
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	1/32	—
Bowl	Part No.	25952	8521	8520	9181	8597	9470	8853	9044
	Weight	1-1/4	1-1/4	1-1/2	1-1/2	3-1/2	5	6	7

Bowen Internal Cutter - Itco Type - Replacement Parts (Continued)

Designed To Cut		1.9 Tub.	2-3/8 Tub.	2-7/8 Tub.	2-7/8 Tub.	3-1/2 O.D. Tub.	4-1/2 F.H. D.P.	4-1/2 I.F. D.P.	5 I.U. D.P.
			2-7/8 I.F. D.P.		3-1/2 I.F.D.P.	4 Tub.	4-1/2 F.H.D.P.	4-1/2 Csg.	
Can Be Dressed To Cut - See Table On Pages 14 And 15			2-7/8 Tub.					4-3/4 Csg.	
								5 Csg.	
Grip Jaw Stop	Part No.	25953	8446	8515	9182	8590	9471	8590	8590
	Weight	1/16	1/16	1/8	1/8	1/4	1/4	1/4	1/4
Grip Jaw Stop Screw (3 Req'd.)	Part No.	23096	62517	62517	62517	62681	62681	62681	62681
	Weight	1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Wickered Sleeve Long	Part No.	25954	8568	8568	9185	8591	9475	8591	9045
	Weight	3-1/2	3-1/2	3-1/2	1/2	1/2	1/2	1/2	1/2
Bottom Nut	Part No.	25955	8565	8566	8566	8596	9476	8857	8857
	Weight	1	1-1/8	2	2	2-3/4	3	6	6
Wiper Block* (3 Req'd.)	Part No.	—	—	—	—	8598	—	8854	—
	Weight	—	—	—	—	1/4	—	3/8	—
Wiper Block Spring* (9 Req'd.)	Part No.	—	—	—	—	8599	—	8863	—
	Weight	—	—	—	—	1/32	—	1/32	—
Wiper Block Screw* (6 Req'd.)	Part No.	—	—	—	—	8856	—	8856	—
	Weight	—	—	—	—	1/64	—	1/64	—
Bowl Drag Spring Type*	Part No.	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—
Mandrel Extension*	Part No.	—	**	—	9183	8595	9472	8595†	9093
	Weight	—	—	—	3	3	3	3	3
Drag Spring* (3 Req'd.)	Part No.	25956	8569	8569	8569	8592	8592	8592†	9092
	Weight	1/16	1/16	1/16	1/16	1/8	1/8	1/8	1/8
Drag Spring Ring*	Part No.	25957	8500	8518	8518	8594	9473	8855†	8855
	Weight	1/8	1/8	1/4	1/4	3/4	1-1/4	1-1/2	1-1/2
Drag Spring Screw* (6 Req'd.)	Part No.	23096	62517	62517	62517	62734	62681	8593†	62681
	Weight	1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Wickered Sleeve Short	Part No.	—	8568	8564	—	—	—	—	—
	Weight	—	2-1/4	2-1/4	—	—	—	—	—
Drag Spring Short (3 Req'd.)	Part No.	—	—	8449	—	—	—	—	—
	Weight	—	—	1/16	—	—	—	—	—
Rod Knife	Part No.	—	—	9423	—	—	—	—	—
	Weight	—	—	1	—	—	—	—	—
Top Thrust To Cut Coupling	Part No.	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—
Complete Assembly W/ Drag Spring*	Part No.	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—

Special Notes:

- (1) * Where both Wiper Block and Drag Spring parts are shown, the Cutter can be ordered with either.
If not specified, Wiper Block parts will be furnished.
- (2) † These parts are not required when parts for optional sizes on page 14 are ordered.
- (3) ** Wicker Sleeve and Mandrel Extension combined.

How to Order:

- Specify:** (1) Name and Number of Assembly or Part.
(2) Size of Pipe to be cut.
(3) Whether or not Bottom Nut is to be
Fitted for a Bowen Collar Finder.

Recommended Spares:

- (1) 6 Sets of Knives.
(2) 2 Sets of Knife Pins.
(3) 6 Sets of Knife Springs.
(4) 2 Sets of Knife Spring Screws.
(5) 1 Set of Slips.
(6) 1 Set of Wiper Blocks.
(7) 1 Set of Wiper Block Springs.
(8) 1 Set of Wiper Block Screws.
(9) 1 Set of Grip Jaws.
(10) 1 Set of Grip Jaw Springs.
(11) 1 Wickered Sleeve.
(12) 1 Set of Drag Springs.
(13) 1 Set of Drag Spring Screws.

Bowen Internal Cutter - Ico Type

Principal Parts of All Cutters Are Shown in the Column Under an Assembly No. and may be Adapted to Cut All Other Sizes in its Range by Substituting the Parts Shown Under a Given "Can Be Dressed to Cut" Table. This includes the "Extra" Parts.									
Designed To Cut	5 O.D. Csg.	6 O.D. Csg.	7 O.D. Csg.	8-5/8 & 9 O.D. Csg.	9-5/8 O.D. Csg.	11-3/4 Csg.	13 & 13-3/8 O.D. Csg.	16 Csg.	20 Csg.
Can Be Dressed To Cut - See Table On Pages 14 And 15	5-1/2 Csg.	6-5/8 Csg. 7 Csg.	7-5/8 Csg. 8 Csg. 8-1/2 Csg.	9-5/8 Csg.	10-3/4 Csg. 11-3/4 Csg.	12 L.p.		18-5/8 Csg.	20-3/4 Csg.
Minimum O.D.	4	5	5-11/16	7-1/4	8-1/4		11-3/4	14-1/2	18-5/8
I.D.	5/8	1	1-1/2	2	2-1/4	3-1/4	3-1/4	5	5
Standard Assembly W/ Drag Spring Or Wiper Block	W.B.	W.B.	W.B.	W.B.	W.B.	W.B.	W.B.	W.B.	W.B.
Complete	Part No.	8200	14785	8745	15532	15080	41876	19525	21240
Assembly	Weight	130	180	251	410	680	900	1120	1150
									1200

Replacement Parts

Mandrel	Part No.	8176	14786	8746	15533	15081	41877	19526	21241	19761
	Weight	75	100	110	250	400	500	600	625	650
Knife Bearing (3 Req'd.)	Part No.	8179	8179	8179	15110	15110	15110	15110	15110	15110
	Weight	1/4	1/4	1/4	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife Spring Screw (3 Req'd.)	Part No.	8181	8181	8181	9558	9558	9558	9558	9558	9558
	Weight	1/64	1/64	1/64	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife Spring (3 Req'd.)	Part No.	8180	8180	8180	15111	15111	15111	15111	15111	15111
	Weight	1/32	1/32	1/32	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife (3 Req'd.)	Part No.	8177	8177	8177	15102-c	15102-c	15102-c	15102-c	15102-c	15102-c
	Weight	1/2	1/2	1/2	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife Bearing Screw (3 Req'd.)	Part No.	8229	8229	8229	15553	15112	15112	23003	15112	15112
	Weight	1/64	1/64	1/64	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife Pin (3 Req'd.)	Part No.	8178	8178	8178	15558	15113	15113	39231	15113	15113
	Weight	1/16	1/16	1/16	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife Pin Screw (3 Req'd.)	Part No.	23371	23371	23371	15114	15114	15114	15114	15114	15114
	Weight	1/64	1/64	1/64	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Knife Block (3 Req'd.)	Part No.	8183	8183	8183	15115	15115	15115	15115	15115	15115
	Weight	5/8	5/8	5/8	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.	5 Req'd.
Top Thrust	Part No.	8241	14787	8748	15534	15099	41878	19527	21242	19762
	Weight	1	2	2	3-1/2	4	6	7	10	14
Split Thrust	Part No.	8185	14788	8750	15535	15084	41879	19528	21243	19763
	Weight	2	6	8	10	11	13	14	20	26
Cone	Part No.	8186	14789	8751	15536	15085	41880	19529	21244	19764
	Weight	8	10	25	34	46-1/2	48	50	55	60
Main Spring	Part No.	8187	14790	8752	15537	15086	41881	19530	21245	19765
	Weight	1/2	1-1/2	3	3	3	3-1/2	4	5	6
Spring Stop	Part No.	8209	14791	8753	15538	15087	41882	19531	21246	19766
	Weight	3/8	1/2	1/2	7/8	1	1-1/2	2	3	4
Slip (3 Req'd.)	Part No.	1924‡	14792	8754	15539	15275	41883	19532	21247	19767
	Weight	1-1/8	3	3-3/4	4	4-3/4	5	6-3/4		12
Grip Jaw (Set)	Part No.	8193	14793	8755	15540	15089	41884	19533	21248	19768
	Weight	1/4	1/2	1/2	1	1	1-1/2	1-1/2	2	3
Grip Jaw Spring (3 Req'd.)	Part No.	8194	14797	8756	15108	15108	15108	19534	21249	19769
	Weight	1/32	1/32	1/32	1/32	1/32	1/32	4 Req'd.	4 Req'd.	4 Req'd.
Bowl	Part No.	8190	14794	8761	15542	15090	41885	19535	21250	19770
	Weight	8	16	36	48	58	65	70	75	80

Special Note:

‡Slip No. 1924 is for 15 lb. 5" CSG. For 11.5 lb. to 15 lb. 5" CSG. use Slip No. 28863.

Bowen Internal Cutter - Itco Type - Replacement Parts (Continued)

		5	6	7	8-5/8	9-5/8	11-3/4	13 &	16	20
Designed To Cut		O.D.	O.D.	O.D.	& 9	O.D.	Csg.	13-3/8	Csg.	Csg.
		Csg.	Csg.	Csg.	O.D.	Csg.		O.D.		
					Csg.			Csg.		
Can Be Dressed To Cut -		5-1/2	6-5/8	7-5/8	9-5/8	10-3/4	12"		18-5/8	20-3/4
See Table On Pages 14 And 15		Csg.	Csg.	Csg.	Csg.	Csg.	L.P.		Csg.	Csg.
				8		11-3/4				
				Csg.		Csg.				
Grip Jaw Stop	Part No.	8202	14795	8757	15543	15091	41886	19536	21251	19771
	Weight	2	2	2	3	3-1/2	7	9	8	7
Grip Jaw Stop Screw	Part No.	25221	8251	8251	8251	8251	8251	41871	21679	8251
(3 Req'd.)	Weight	1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64	1/64
Wickered Sleeve	Part No.	8236	14799	8762	15546	15096	41888	19540	21253	19778
	Weight	1	1-3/4	2	4	5-1/2	7	9	15	17
Bottom Nut	Part No.	8196	14800	8763	15547	15097	41889	19541	21254	19779
	Weight	11	16	24	48	61	70	75	80	110
Wiper Block*	Part No.	8191	14801	8758	15548	15098	41887	19542	21252	19772
(3 Req'd.)	Weight	1/2	2	2-1/8	3	4	4-1/2	6	8	6
								Req'd.	Req'd.	Req'd.
Wiper Block Spring*	Part No.	8599	8759	8759	15276	15276	15276	15276	15276	15276
	Weight	24	24	24	36	36	36	72	54	48
	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.
Wiper Block Screw*	Part No.	8856	8760	8760	8760	8760	8760	8760	21678	8760
	Weight	1/64	1/32	1/32	1/32	1/32	1/32	1/32	1/32	1/32
		6	6	6	6	6	6	6	12	6
	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.	Req'd.
Bowl Drag Spring Type*	Part No.	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—
Mandrel Extension*	Part No.	8237†	14796†	8246†	15544†	15092†	41892†	19537	21255	19773†
	Weight	8	9	10	12	14	15	16	17	18
Drag Spring*	Part No.	8203†	8247†	8247†	15093†	15093†	41890†	19538	21256	19774†
(3 Req'd.)	Weight	3/4	3/4	3/4	1	1	1	6 Req'd.	6 Req'd.	6 Req'd.
Drag Spring Ring*	Part No.	8205†	14798†	8248†	15545†	15095†	41891†	19539	21257	19799†
	Weight	2-1/4	4	6-1/2	7	8	10	12	15	20
Drag Spring Screw*	Part No.	25221	8251†	8251†	8251†	8251†	8251†	8251†	8251†	8251†
(6 Req'd.)	Weight	3 Req'd.	3 Req'd.	3 Req'd.	3 Req'd.	3 Req'd.	3 Req'd.	6 Req'd.	6 Req'd.	6 Req'd.
Wickered Sleeve Short	Part No.	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—
Drag Spring Short*	Part No.	—	—	—	—	—	—	—	—	—
(3 Req'd.)	Weight	—	—	—	—	—	—	—	—	—
Rod Knife	Part No.	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—
Top Thrust To	Part No.	8242	14802	8749	15541†	15083	41896	—	—	—
Cut Coupling	Weight	1/4	1	1-1/4	2-1/2	3	4	—	—	—
Complete Assembly	Part No.	—	—	—	—	—	—	—	—	—
W/ Drag Spring*	Weight	—	—	—	—	—	—	—	—	—

Special Notes:

- (1) *Where both Wiper Block and Drag Spring Parts are shown, the Cutter can be ordered with either.
(2) †These Parts are not required when Parts for Optional sizes on page 14 are ordered.

How to Order:

- Specify:** (1) Name and Number of Assembly or Part.
(2) Size of Pipe to be cut.
(3) Whether or not Bottom Nut is to be Fitted for a Bowen Collar Finder.

Recommended Spares:

- (1) 6 Sets of Knives.
(2) 2 Sets of Knife Pins.
(3) 6 Sets of Knife Springs.
(4) 2 Sets of Knife Spring Screws.
(5) 1 Set of Slips.
(6) 1 Set of Wiper Blocks.

- (7) 1 Set of Wiper Block Springs.
(8) 1 Set of Wiper Block Screws.
(9) 1 Set of Grip Jaws.
(10) 1 Set of Grip Jaw Springs.
(11) 1 Wickered Sleeve.
(12) 1 Set of Drag Springs.
(13) 1 Set of Drag Spring Screws.

Bowen Internal Cutter - Itco Type

Internal Cutter Conversion Table To Convert Cutters To An Additional Size Parts Listed Must be Changed to Adapt Listed Assembly to "Can Be Dressed To Cut" Size									
Assembly Number	2174	2174	2174	25940	25940	25940	9176	9176	9176
Can Be Dressed To Cut	1-15/16	2-7/8	2-7/8	2-1/16	2-3/8	1.806	2-3/4	3-1/2	3-1/2
Additional Sizes	I.D.	I.F.	Tub.	3.25#	O.D.	I.D.	X 2-3/8	I.F.	D.P.
By Changing Parts	Pipe	D.P.		Tub.	Pipe	X 2-3/8	I.D.	D.P.	
Listed Below						O.d.	Drill Rod		

Replacement Parts

Top Thrust	Part No.	—	8437	8437	—	—	—	—	9178	9178
Slip (3 Req'd.)	Part No.	28894	—	2181	25958	33432	61735	61406	—	2181
Wiper Block (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	58211
Bottom Nut†	Part No.	—	—	—	—	33433	33433	—	—	—
Knife Block (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Top Thrust To Cut Coupling	Part No.	—	—	—	—	—	—	—	—	—
Knife (3 Req'd.)	Part No.	—	—	—	—	33431	33431	—	—	—
Knife (5 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring Screw (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Mandrel Extension	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring Ring	Part No.	—	—	—	—	—	—	—	—	—

Assembly Number	9176	8570	8570	8570	8570	9465	9465	8844	8844
Can Be Dressed To Cut	3-1/2	3-1/2	3-1/2	4.0	4-1/2	4-1/2	4-1/2	4-1/2	4-3/4
Additional Sizes	O.D.	O.D.	O.D.	O.D.	O.D.	X-hole	O.D.	O.D.	O.D.
By Changing Parts	X 3-1/16	Tub.	13.3#	Tub.	Tub.	D.p.	Csg.	Csg. &	Csg.
Listed Below	I.D.		D.P.					Tub.	
	Drill Rod								

Replacement Parts

Top Thrust	Part No.	9178	—	—	8613	8581	—	—	—	8847
Slip (3 Req'd.)	Part No.	61407	—	26515	8577	8587	—	23945	8932	8932
Wiper Block (3 Req'd.)	Part No.	—	—	26516	8614	8605	—	—	8933	8933
Drag Spring (3 Req'd.)	Part No.	58211	8592	—	—	—	8611	23946	—	8611‡
Bottom Nut†	Part No.	—	—	—	8602	8634	9457	—	8934	8934
Knife Block (3 Req'd.)	Part No.	—	—	—	—	22278	—	—	—	—
Top Thrust To Cut Coupling	Part No.	—	—	—	—	—	—	—	—	—
Knife (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Knife (5 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring Screw (3 Req'd.)	Part No.	—	62734	—	—	—	—	—	—	—
Mandrel Extension	Part No.	—	8595	—	—	—	—	—	—	—
Drag Spring Ring	Part No.	—	8594	—	—	—	—	—	—	—

Bowen Internal Cutter - Iico Type

Internal Cutter Conversion Table To Convert Cutters To An Additional Size. Parts Listed Must Be Changed To Adapt Listed Assembly To "Can Be Dressed To Cut" Size									
Assembly Number	8844	8844	8200	8200	8200	8200	14785	14785	14785
Can Be Dressed To Cut	5.0	5-1/2	5.0	5-1/2	5-1/2	5-3/4	6-5/8	7.0	7-5/8
Additional Sizes	O.d.	O.d.	Csg.	O.D.	O.D.	O.D.	O.D.	O.D.	O.D.
By Changing Parts	Csg.	Csg.		Csg.	Csg.	Csg.	Csg.	Csg.	Csg.
Listed Below				13# - 15#	17#-25#				

Replacement Parts

Top Thrust	Part No.	8847	8847	—	8242	8242	54550	14802	14816	14816
Slip (3 Req'd.)	Part No.	14004	53055	28863	8407	8405	54551	14803	29499	52812
Wiper Block (3 Req'd.)	Part No.	14001	53056	—	8219	8219	54552	14818	20982	52813
Drag Spring (3 Req'd.)	Part No.	8611†	8611†	—	8207‡	8207‡	54553‡	8249‡	36499‡	—
Bottom Nut†	Part No.	14002	14002	—	8234	8234	8234	14817	36498	36498
Knife Block (3 Req'd.)	Part No.	14003	53057	—	—	—	—	—	—	—
Top Thrust To Cut Coupling	Part No.	—	—	—	—	—	—	14816	—	—
Knife (3 Req'd.)	Part No.	—	9042	—	—	—	—	—	—	52814
Knife (5 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring Screw (3 Req'd.)	Part No.	—	—	—	8207	8207	—	—	—	—
Mandrel Extension	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring Ring	Part No.	—	—	—	—	—	—	—	—	—

Assembly Number	8745	8745	15532	15532	15532	15080	41876	21240	19760
Can Be Dressed To Cut	7-5/8	8-1/8	9.0	9-5/8	9-5/8	10-3/4	12.0	18-5/8	20-3/4
Additional Sizes	O.D.	O.D.	Coupling	O.D.	Coupling	O.D.	L.P.	O.D.	O.D.
By Changing Parts	Csg.	Csg.	& 9-5/8	Csg. &		Csg. &		Csg.	Csg.
Listed Below			O.d.	8-5/8		10-3/4			
			Csg.	Coupling		Coupling			

Replacement Parts

Top Thrust	Part No.	8749	8749	15541	15541	15541	15083	41896	—	19776
Slip (3 Req'd.)	Part No.	8764	15408	15551	15551	15551	15088	41894	21672	19777
Wiper Block (3 Req'd.)	Part No.	8770	15407	15554	15554	15554	15101	41893	21671*	19775*
Drag Spring (3 Req'd.)	Part No.	—	8249‡	15109‡	15109‡	15109‡	15109‡	—	—	—
Bottom Nut†	Part No.	8774	15405	15552	15552	15552†	15268	41895	21674	—
Knife Block (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Top Thrust To Cut Coupling	Part No.	—	—	15550	15549	15549	15116	—	—	—
Knife (3 Req'd.)	Part No.	8177	15406	—	—	—	—	—	—	—
Knife (5 Req'd.)	Part No.	—	—	—	—	—	—	—	21673	—
Drag Spring Screw (3 Req'd.)	Part No.	—	—	—	—	—	—	—	—	—
Mandrel Extension	Part No.	—	—	—	—	—	—	—	—	—
Drag Spring Ring	Part No.	—	—	—	—	—	—	—	—	—

Special Notes:

- (1) *6 Req'd. For Assemblies 21240 And 19760.
- (2) †These oversize bottom nuts are available where centralizing is required.
- (3) ‡Use when Drag Spring required.

Bowen Internal Cutter Accessories - Collar Finders

Size (Body O.D.)		1 ³ / ₄	2 ³ / ₁₆	2 ¹ / ₂	3 ³ / ₈	4 ³ / ₈	5	6	7	8 ⁵ / ₈
For Use With Nominal		2 ³ / ₈	2 ⁷ / ₈	4 ¹ / ₂	4 ¹ / ₂	5 ¹ / ₂	6 ⁵ / ₈	7 ⁵ / ₈	8 ⁵ / ₈	10 ³ / ₄
Size Cutter		TBG.	TBG.	IU DP	IF DP	CSG.	CSG.	CSG.	CSG.	CSG.
Max. Expansion of Collar Locators		2 ⁷ / ₈	3 ¹ / ₂	4 ¹ / ₂	5 ¹ / ₂	6 ⁵ / ₈	7 ⁵ / ₈	8 ⁵ / ₈	9 ⁵ / ₈	12 ¹ / ₄
Complete	Part No.	5007	5015	5022	3758	5030	5040	5047	5052	5057
Assembly	Weight	17	25	38	70	123	156	182	316	373
Bowl	Part No.	5008	5016	5023	3759	5031	5041	5041	5062	5062
	Weight	5	7	11	16	26	35	35	57	57
Mandrel	Part No.	5009	5017	5024	3760	5032	5042	5042	5063	5063
	Weight	3	5	6	11	23	34	34	59	59
Mandrel Spring	Part No.	5010	5018	5025	5465	5033	5043	5043	5064	5064
	Weight	1	2	3	5	7	9	9	23	23
Body	Part No.	5011	5019	5026	3761	5034	5044	5048	5053	5058
	Weight	5	8	12	29	51	48	78	136	181
Collar Locator (2 Req'd.)	Part No.	5012	5012	5027	3762	5035	4187	5049	5054	*5059-1
	Weight	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₂	3 ¹ / ₄	1 ¹ / ₂	2 ¹ / ₂	3	3 ¹ / ₂	4
Collar Locator Spring	Part No.	5012-2	5012-2	5027-2	3762-2	5035-2	4187-2	5049-2	5054-2	5054-2
	Weight	1 ¹ / ₅₀	1 ¹ / ₅₀	1 ¹ / ₃₂	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₁₀	1 ¹ / ₁₀	1 ¹ / ₈	1 ¹ / ₈
Shear Pin	Part No.	5013	5020	5028	5466	5036	5036	5050	5055	5060
	Weight	1 ¹ / ₃₂	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₁₆	1 ¹ / ₁₀	1 ¹ / ₈	1 ¹ / ₄	1 ¹ / ₃
Sleeve	Part No.	5014	5021	5029	3763	5037	5046	5051	5056	5061
	Weight	1	1 ¹ / ₄	2 ¹ / ₄	3	7	14	17 ¹ / ₂	29	40
Sleeve Retainer Nut	Part No.	5014-1	5021-1	5029-1	3763-1	5037-1	5046-1	5051-1	5056-1	5061-1
	Weight	1 ¹ / ₄	1 ¹ / ₂	2 ¹ / ₂	5	7	13	5 ¹ / ₂	8	8 ¹ / ₂
Sleeve Retainer	Part No.	5014-2	5021-2	5029-2	3763-2	5037-2	5046-2	5051-2	5056-2	5061-2
Nut Set Screw	Weight	1 ¹ / ₂₀₀	1 ¹ / ₂₀₀	1 ¹ / ₂₀₀	1 ¹ / ₁₅₀	1 ¹ / ₁₀₀	1 ¹ / ₁₀₀	1 ¹ / ₁₀₀	1 ¹ / ₂₅	1 ¹ / ₂₅

* Collar Locator For 13 & 13³/₈ Casing Part No. 5059 Weight 4¹/₂

Stabilizers

Size (Body O.D.)		1 ³ / ₄	2 ³ / ₁₆	2 ¹ / ₂	3 ³ / ₈	4 ³ / ₈	5 ³ / ₈	6 ³ / ₈	7 ¹ / ₄	9 ¹ / ₄
Overall Length (Inches)		22	22	32	39	41	45	46	51	54
Complete	Part No.	4981	2812	4985	4989	2933	4993	4997	2937	2941
Assembly	Weight	12	15	25	54	88	136	197	269	568
Body	Part No.	4982	2813	4986	4990	2934	4994	4998	2938	2942
	Weight	8	10	15	29	43	75	115	170	375
Bottom Sub	Part No.	4983	2814	4987	4991	2935	4995	4999	2939	2943
	Weight	3	4	8	21	37	48	65	77	154
Spring Collar	Part No.	4984	2815	4988	4992	2936	4996	5000	2940	2944
Body	Weight	1 ¹ / ₂	1 ¹ / ₂	3 ¹ / ₄	1 ¹ / ₂	3	5	7	9	16
Spring Collar Sleeve	Part No.	4984-1	2815-1	4988-1	4992-1	2936-1	4996-1	5000-1	2940-1	2944-1
	Weight	1 ¹ / ₈	1 ¹ / ₈	1 ¹ / ₄	1 ¹ / ₂	7 ¹ / ₈	1	1 ¹ / ₂	2	3 ¹ / ₂
Spring Collar Screw	Part No.	4984-2	2815-2	4988-2	4992-2	2936-2	4996-2	5000-2	2940-2	2944-2
(3 Req'd.)	Weight	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₂₀
Friction	Part No.	3658	2809	3425	2846	2343	3246	3449	2890	2904
Spring	Weight	1 ¹ / ₄	1 ¹ / ₃	1 ¹ / ₃	1	1	2	2	3 ¹ / ₂	6
(3 Req'd.)										
Spring Sleeve	Part No.	3658-A	2809-A	3425-A	2846-A	2343-A	3246-A	3449-A	2890-A	2904-A
	Weight	1 ¹ / ₄	1 ¹ / ₃	1 ¹ / ₂	1	2 ¹ / ₂	4 ¹ / ₂	6	7 ¹ / ₂	14
Spring Sleeve Screw	Part No.	3658-B	2809-B	3425-B	2846-B	2343-B	3246-B	3449-B	2890-B	2904-B
(3 Req'd.)	Weight	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₂₀	1 ¹ / ₂₀

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* Denotes Manufacturing and Engineering facilities

Downhole Solutions

Drilling Solutions

Engineering and Project Management Solutions

Lifting and Handling Solutions

Production Solutions

Supply Chain Solutions

Tubular and Corrosion Control Solutions

Well Service and Completion Solutions